

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594



March 22, 2022

MATERIALS LABORATORY FACTUAL REPORT

Report No. 22-013

A. ACCIDENT INFORMATION

Place : Ely, Nevada
Date : July 11, 2020
Vehicle : ASW27-18 Glider, N167TM
NTSB No. : WPR20LA216
Investigator : Stephen Stein

B. COMPONENTS EXAMINED

Right and left rocker assemblies with brass end fittings for Bowden cables (Figure 1). Water ballast release levers with portions of Bowden cables attached (Figure 2). Two portions of Bowden cables (Figures 3, 4).

C. DETAILS OF THE EXAMINATION

The right and left rocker assemblies remained attached to portions of the aircraft's structure (Figure 1). The rocker assemblies consisted of a metal plate that could pivot between two trunnions. The motion of the rocker would be caused by a pulling force from a Bowden cable attached to a brass end fitting attached to the rocker plate (Figures 5, 6). The brass end fittings had a hollow portion where the Bowden cable would have been inserted and crimped into place. The brass end fittings had a depth of approximately 0.47 inch of allowable insertion depth for the Bowden cable. The crimps on both brass end fittings appeared to have been made at similar locations and to a similar level of indentation based on a visual comparison (Figure 7). Examination of the open ends of the brass end fittings (the end where the stranded cable would have been inserted) revealed similar levels of constriction of the bore (Figure 8).

The Bowden cables attached to the water ballast release lever were numbered as shown in figure 9. The Bowden cables passed through a bracket with tensioning fittings (Figure 10) which are numbered in a consistent manner as the numbering of the cables shown in figure 9. Cable #4 was attached to the lever labeled "Fuselage". Cables #1, #2, #3 were attached to the lever labeled "Wing + Tail". All the stranded cables were the same diameter of approximately 0.060 inch. The free ends of these cables were examined with a stereo microscope to determine if the free ends were cut with a tool as might be done in the original assembly or wreckage recovery or if the ends were the result of fractures.

Cable #1 extended approximately 40" past the tensioning fitting. The strands of cable #1 exhibited fracture features consistent with a complex loading overstress fracture. Some of the strands exhibited deformation consistent with crushing. No fatigue fracture features were observed.

Cable #2 extended approximately 16" past the tensioning fitting. The strands of cable #2 exhibited necking down at the fracture consistent with tensile overstress fracture.

Cable #3 extended approximately 40" past the tensioning fitting. The strands of cable #3 exhibited fracture features consistent with a complex loading overstress fracture. Some of the strands exhibited deformation consistent with crushing. No fatigue features were observed.

The portion of Bowden cable shown in figure 3 had portions of the sheath remaining and a small portion of fuselage structure attached. The stranded wire portion of this cable was approximately 45" long and did not extend the full length of the sheathing. The free end of the stranded cable near the portion of the attached fuselage fragment exhibited fracture features consistent with having been cut with a tool such as a pair of wire cutters.

The portion of Bowden cable shown in figure 4 did not have any of the sheath present. The stranded cable was approximately 66" long. Both ends of the stranded cable exhibited fracture features consistent with a complex loading overstress fracture. No fatigue fracture features were observed.

Joseph Panagiotou
Fire Protection Engineer

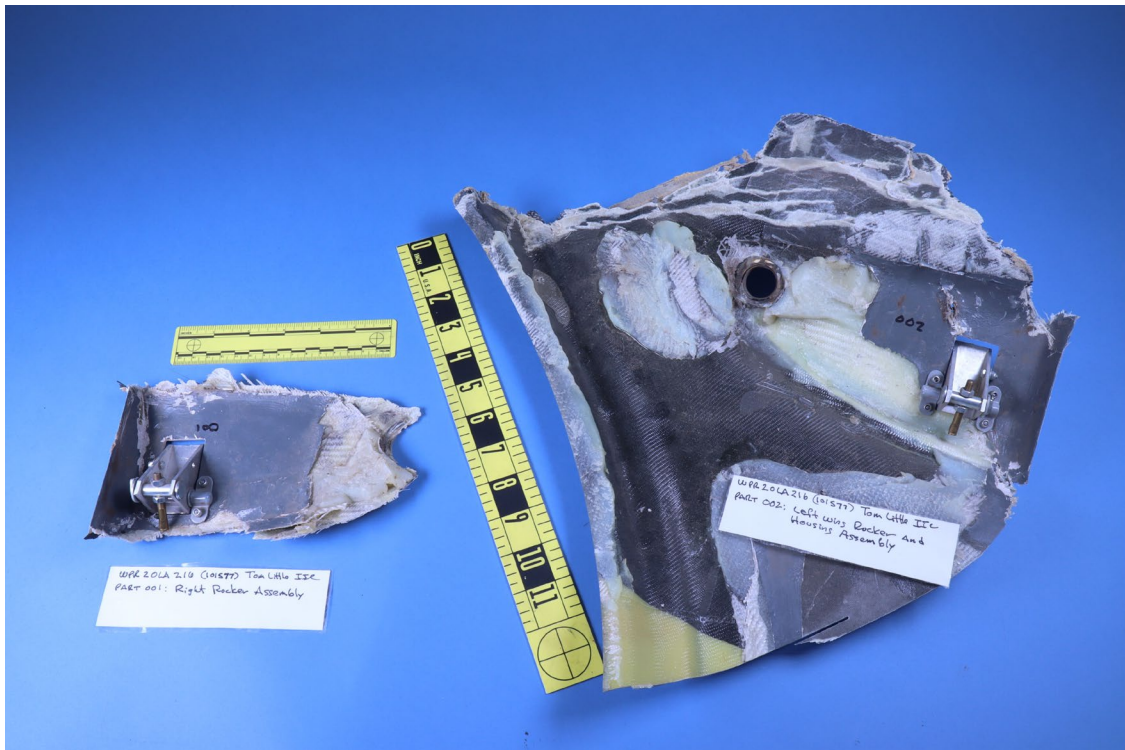


Figure 1: Right and left rocker assemblies with brass end fittings for Bowden cables attached to portions of fuselage (as received).

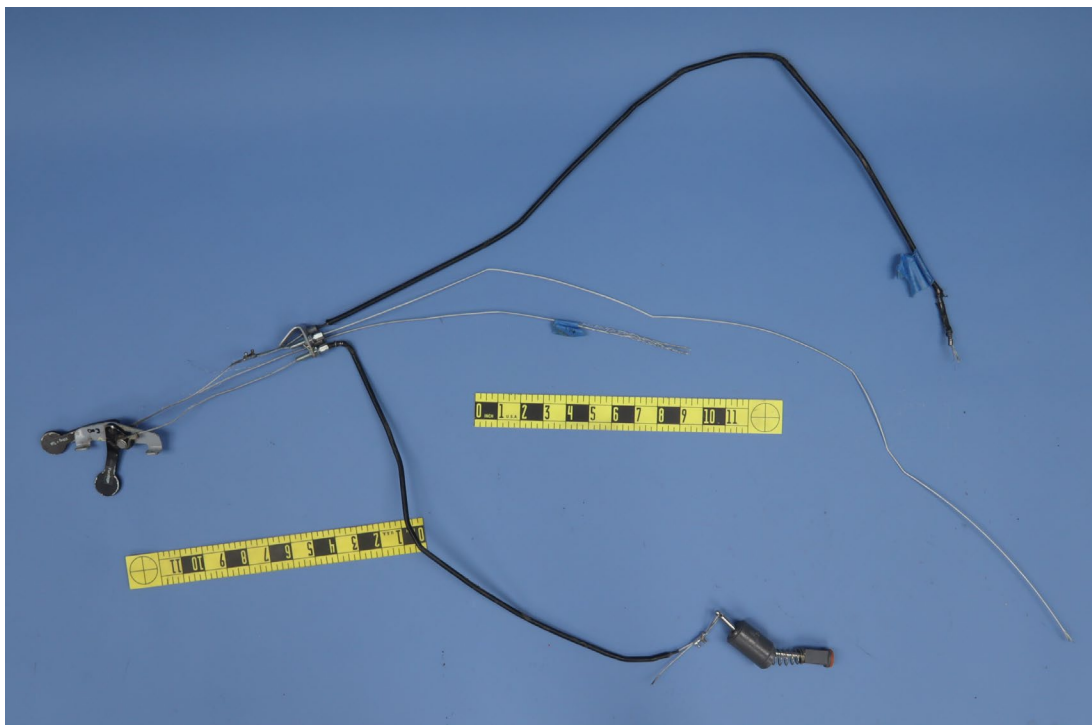


Figure 2: Water ballast release levers with portions of Bowden cables attached (as received).



Figure 3: Portion of Bowden cable with sheathing and a fragment of fuselage (as received).

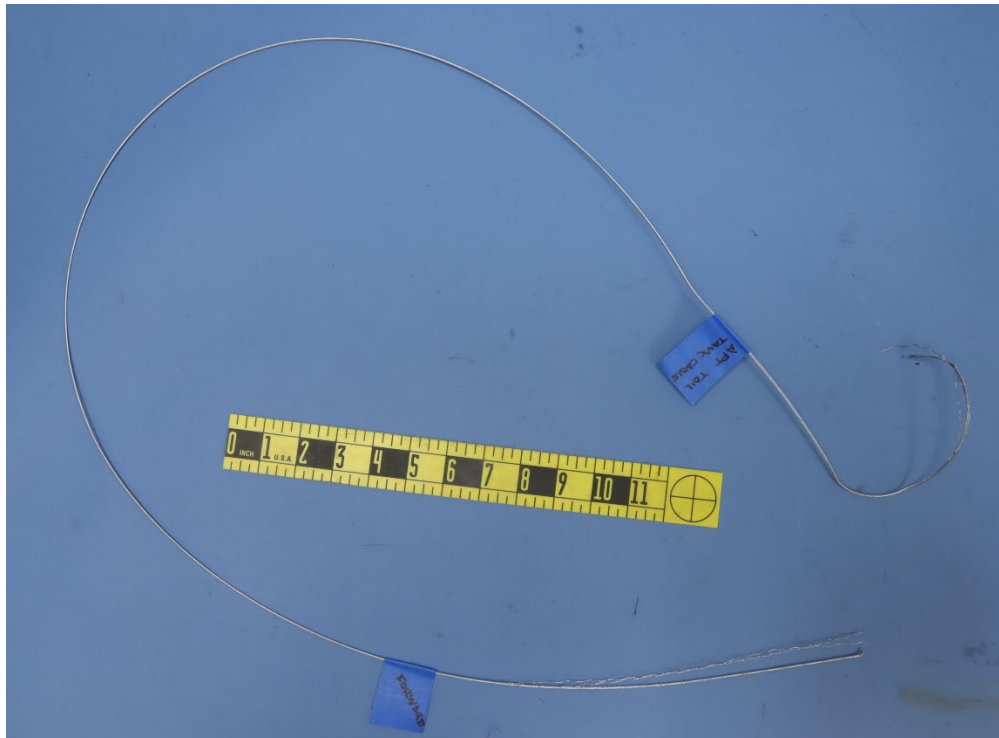


Figure 4: Portion of Bowden cable without sheathing (as received).

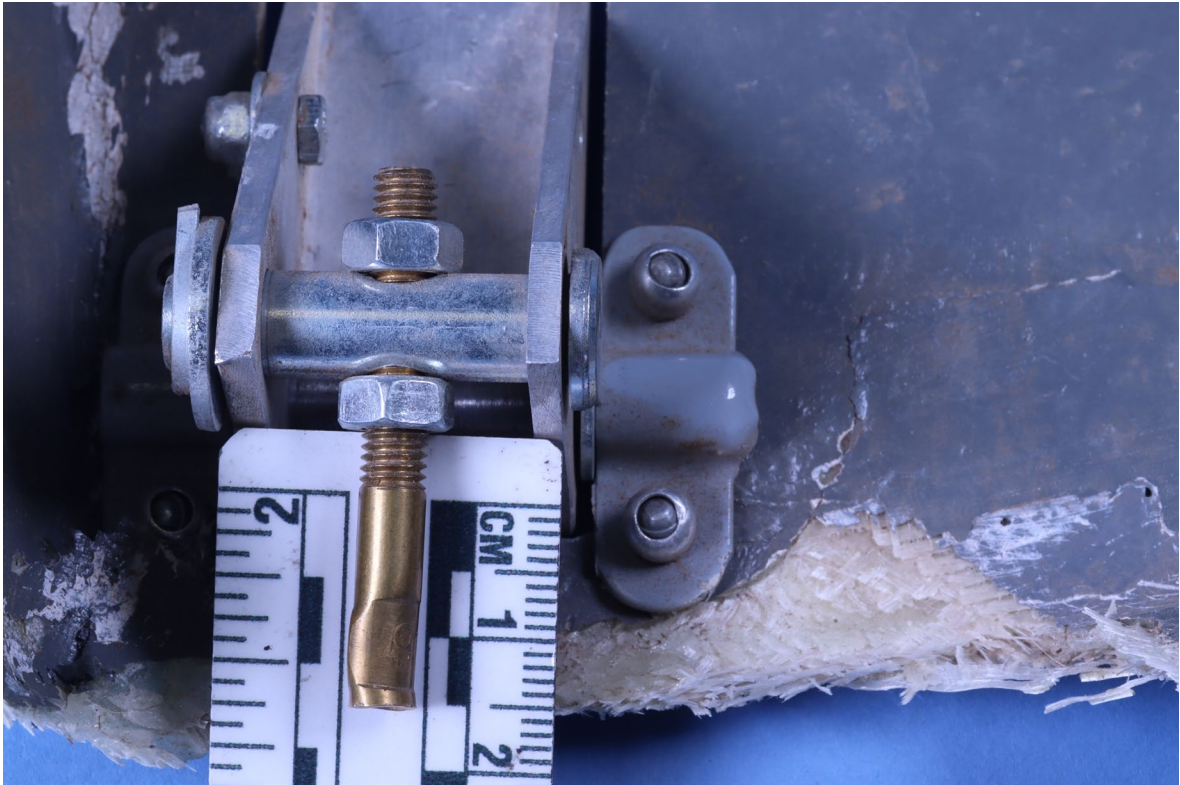


Figure 5: Right rocker end fitting.

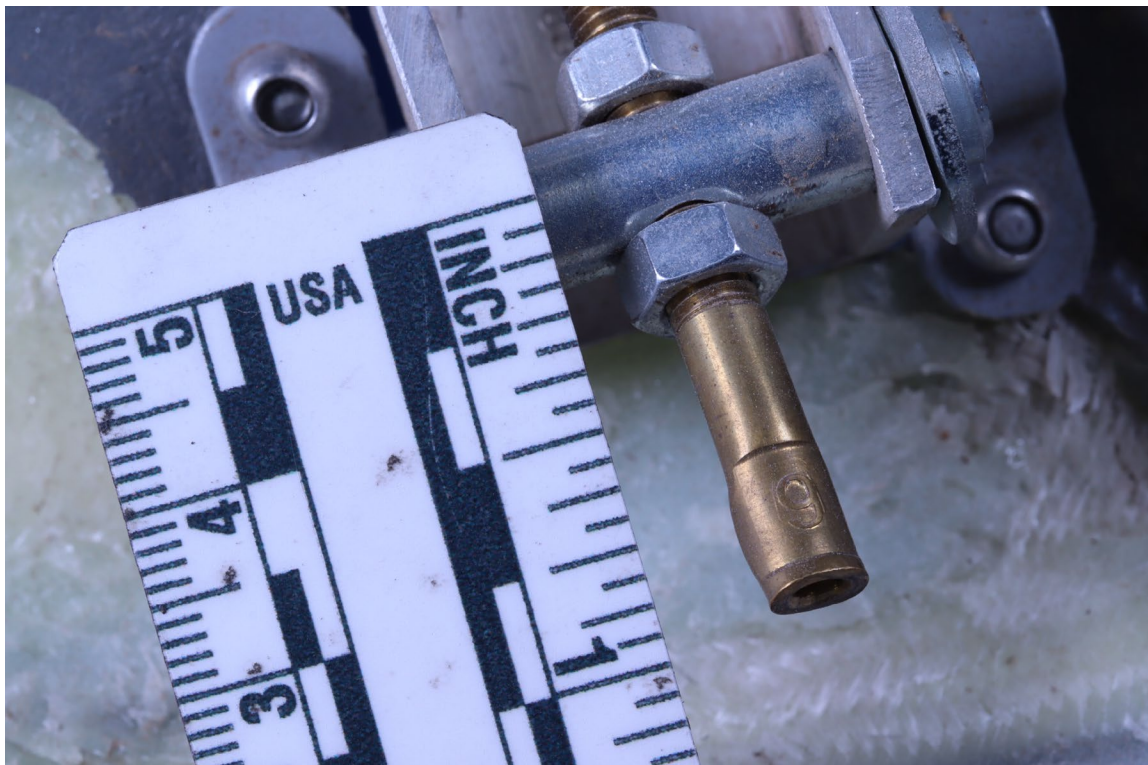


Figure 6: Left rocker end fitting.

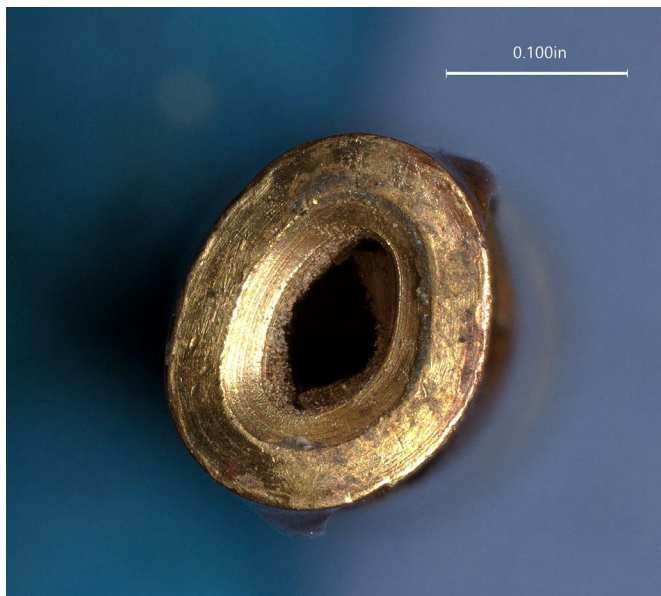


Left

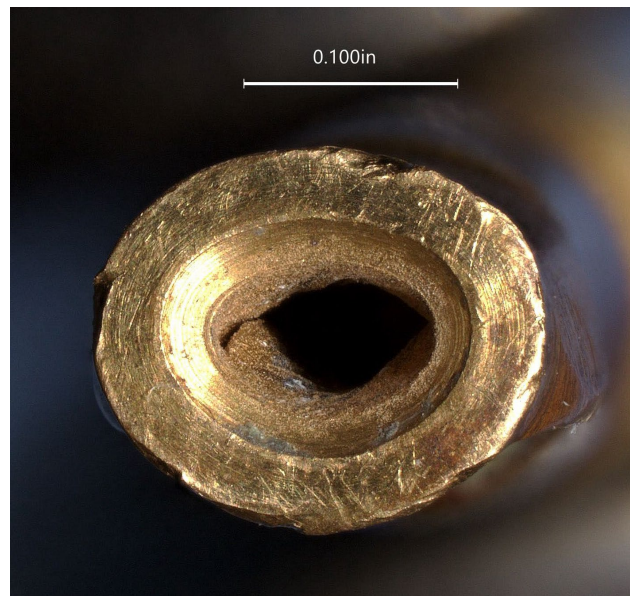


Right

Figure 7: Crimps on left and right cable end fittings.



Left



Right

Figure 8: Crimped bores on left and right cable end fittings.

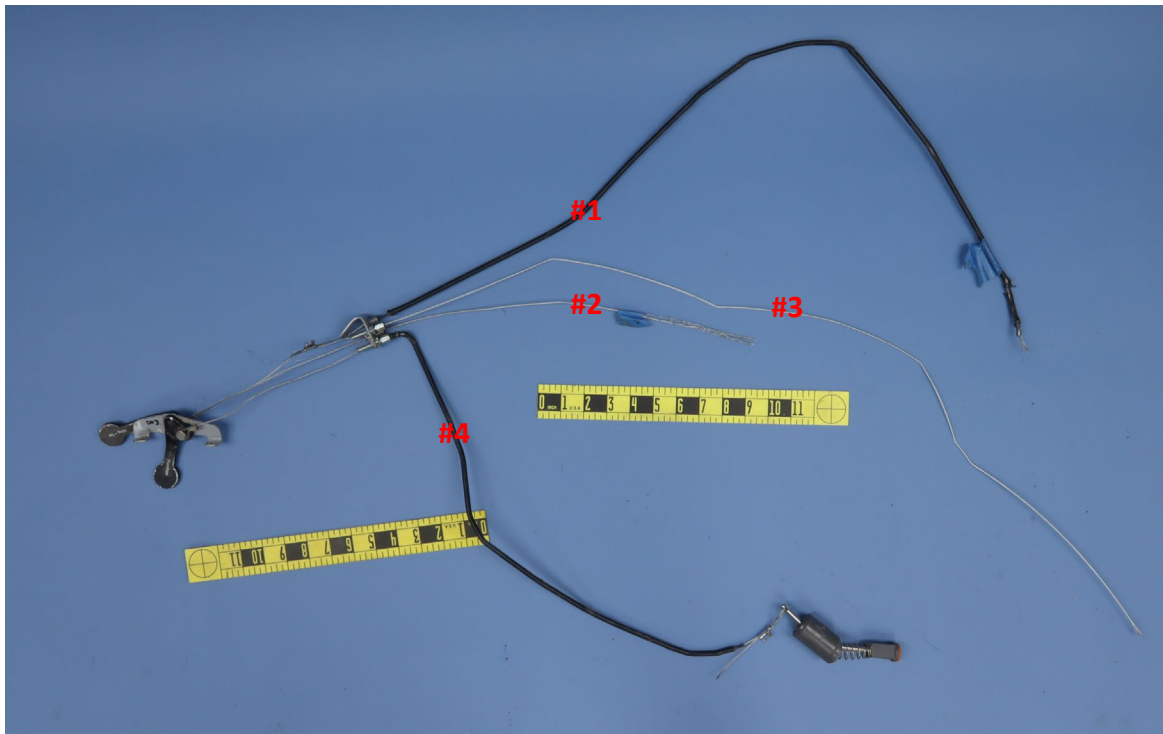


Figure 9: Numbering convention of portions of Bowden cables attached to levers.

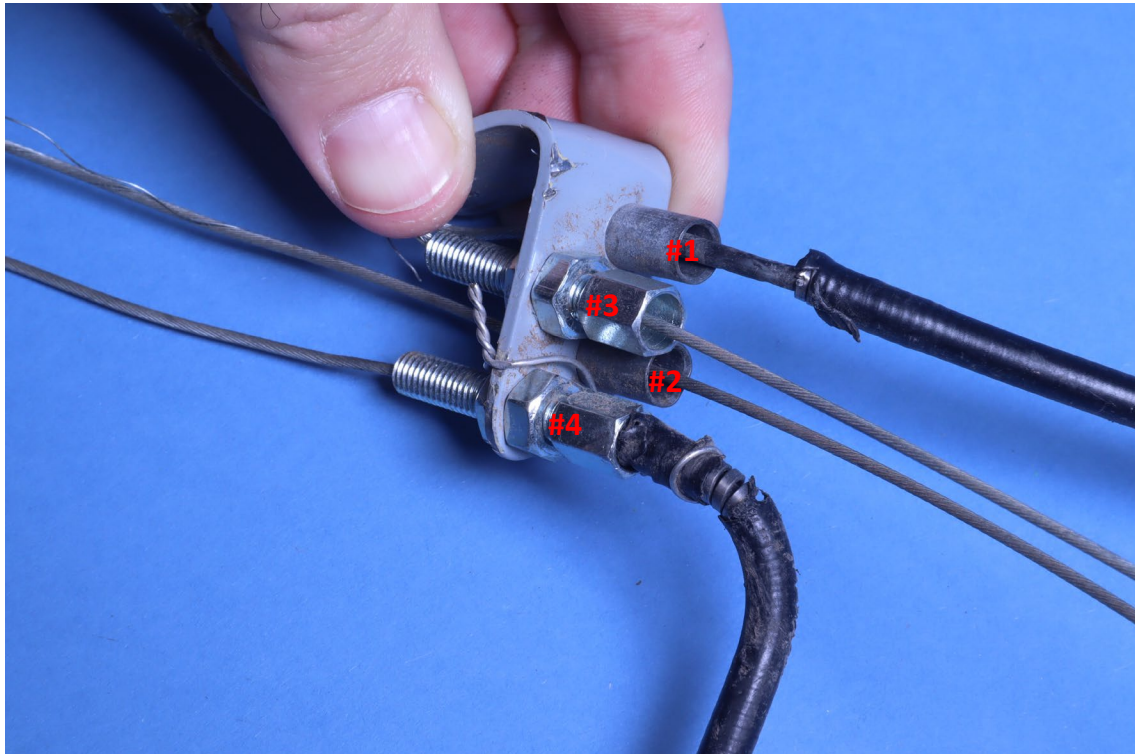


Figure 10: Numbering convention of cables at tensioning fittings (same numbering as in Figure 9).